PATENT SPECIFICATION

393.761

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Application Date (in United Kingdom): June 28, 1932. No. 18,206/32.

Complete Accepted: June 15, 1933.

COMPLETE SPECIFICATION.

Improvements in Relief Valves.

I, HARRY FRANKLIN VICKERS, of 7752, Dubois Street, Detroit, Wayne County, Michigan, United States of America, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to relief valves for systems employing oil under pressure and more particularly to a balanced relief valve for accurately controlling pressure limits.

It is the object of the present invention to keep the oil which is the pressure liquid employed in the hydraulic system of the invention, in as coherent and smooth a jet as possible.

This is desirable on two grounds. Firstly because it keeps down the heat and secondly because it prevents foaming.

Foaming in a hydraulic system is very undesirable, and usually a great amount of foaming renders the system unworkable.

According to the present invention the relief valve is gradually inwardly converging and concave from the point of contact with the valve seat, to the discharge end of the valve.

The invention is more particularly described with reference to the accompanying drawings in which:—

Figure 1 is a longitudinal sectional view through a balanced relief valve constructed in accordance with the present invention.

Figure 2 is a front elevation thereof.

Figure 3 is a sectional view similar to Fig. 1, but illustrating slightly modified details in some of the parts thereof.

Figure 4 is a diagrammatic view illustrating one manner of embodying my relief valve in a simple hydraulic circuit.

The relief valve may be installed in any pipe line containing liquid which is subject to pressure. Referring to Fig. 4, as showing a simple standard circuit, it will be seen that a pump 2 of any desired capacity will deliver liquid from the tank to the control valve 3 for operation of the motor 4. The exact pressure at which the liquid is delivered to the control valve and the motor may be determined by means of my relief valve which may be designated 5. This relief valve may be inserted as shown in the same position and in the same manner as any standard relief valve.

Referring more particularly to Fig. 1, the liquid normally flows into the chamber 6 around the stem 7 of the main control valve which may be generally designated 8. This control valve 8 is in inoperative position held upon its seat by a relatively weak spring 9.

The chamber 6 communicates through a passageway 10 and an orifice 11 with a chamber 12 formed within the valve casing, which chamber contains the piston 13. In the construction shown in Figure 1, suitable grooves 14 are provided for insuring the application of pressure to the entire bottom area of the piston 13, but it will be understood that said piston may be continued down to a point adjacent the stem 7 of the valve 8.

As pressure is built up in the chambers 6 and 12, it exerts an opposing force upon the piston 13, and inasmuch as upper area of the piston 13 minus guide 15 is greater than the bottom area of the piston 13 minus the area of the stem 7. the greater force of the liquid is downward tending to seat the valve 8 more firmly against the valve seat 16.

A control valve 17 for determining the relief pressure is in the form of a spring pressed ball or valve backed by an adjustable member 18 for controlling the pressure of the spring, and is positioned between the chamber 12 and the exhaust passageway 19. A relatively large passageway 20 connects the chamber 12 with the control valve 17.

With the pump 2 in operation and liquid flowing through the chamber 6 of the relief valve, the spring pressure upon the ball 17 may be regulated to give the desired pressure at which the system is to operate, say, for instance, five hundred pounds. When the pressure on the control valve 17 exceeds this adjusted pressure, the control valve ball will move downwardly permitting the liquid to flow

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to the liquid return passageway 19. As the diameters of the valve 17 and the passageway 20 are relatively greater than the small orifice 11, the escapement of liquid takes place more rapidly through the passageway 20 than it can be replaced through the orifice 11, thus preventing a further pressure rise in the chamber 12. The result of this action is that the downwardly exerted force of the liquid on the piston 13 immediately becomes less than the upwardly exerted force by the incoming liquid under pressure so that the piston will immediately move upwardly and unseat the valve 8, permitting liquid to escape from the chamber 6 into the discharge passageway 19 until a pressure balance is again obtained between the chambers 6 and 12, at which time the valve will again be seated due to the differential area between the upper and lower ends of the piston 13.

The large effective area of the piston 13 makes for very great accuracy whereby to give a full opening of the valve with a very small change in pressure above the pressure at which the relief valve is set.

The end of the valve 8 terminates in an inwardly and downwardly converging portion 21 which is designed to materially reduce the turbulence of the oil or liquid flowing past the valve so as to positively prevent any chattering or vibration. An axial passageway 22 throughout the valve and terminating adjacent the inwardly tapered end of the valve results in an ejector effect and the producing of a vacuum which may be utilized for various purposes.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. A relief valve for use in systems employing oil under pressure, in which the valve is gradually inwardly converging and concave from the point of contact with the valve seat to the discharge end of the valve.

2. A relief valve for systems employing oil under pressure as claimed in claim 1, comprising a housing having a liquid return conduit, a main flow valve co-operating with said return conduit, the movement of said valve being directly controlled by differential pressures, a portion of said main flow valve extending past the entrance to said return conduit being convergently shaped and concave from the point of contact with the valve seat to the end of the valve.

3. A relief valve for hydraulic systems as claimed in claim 2 having a differential piston connected to, but spaced from the valve, for actuating same in two directions, and an auxiliary relief valve subject to the pressure of the liquid in the system for controlling the operation of said piston to control in turn the opening and closing of said valve.

4. A relief valve as claimed in claim 3 having a restricted conduit subject to the liquid pressure in the system, and connecting both sides of the piston, said auxiliary relief valve and said conduit co-operating to cause pressure on the opposite sides of said piston to control the movement thereof.

5. A relief valve as claimed in claims 3 or 4 in which one end of the piston has a greater effective area, and said auxiliary relief valve is in communication with the end having the greater area.

6. A relief valve as claimed in claims 3, 4 or 5 having a sleeve containing a spring extending from the end of the piston of greater surface area into a guide.

7. A relief valve as claimed in any of the preceding claims in which the valve has an axial passageway terminating at the shaped end thereof to produce a partial vacuum in the passageway when the valve is open

8. A relief valve constructed and arranged to operate substantially as described with reference to the accompanying drawings.

Dated this 27th day of June, 1932.
W. P. THOMPSON & Co.,
12, Church Street, Liverpool 1.
Chartered & Registered Patent Agents.

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SHEET 1

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Fig. 1.

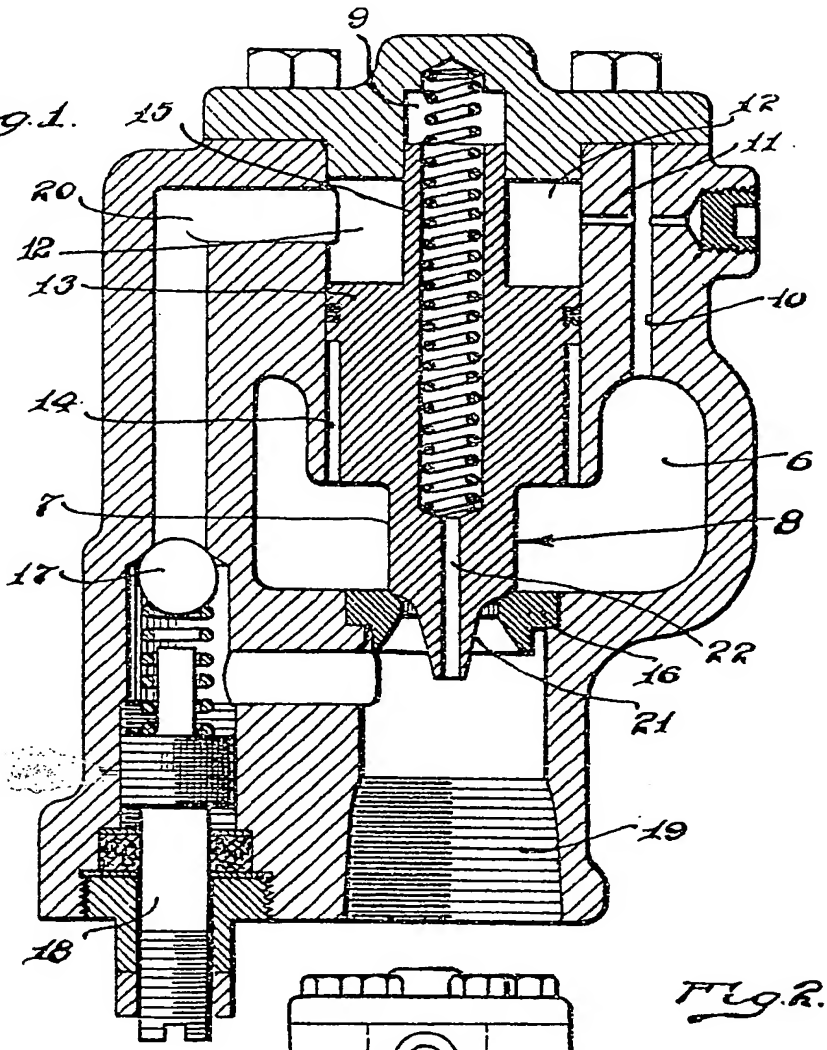

Fig. 2.

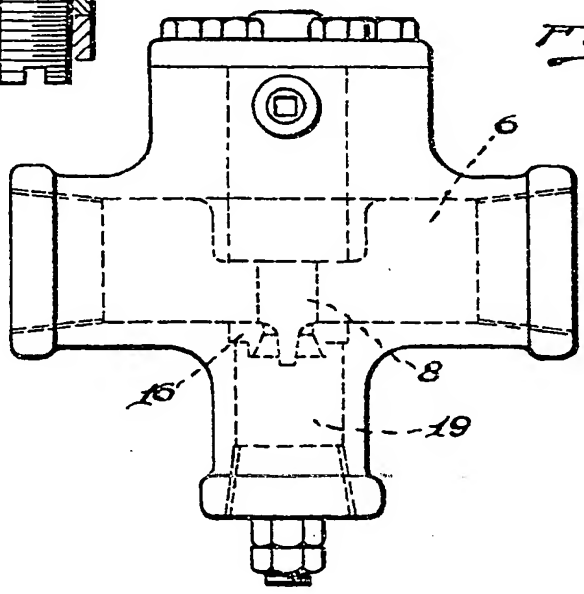

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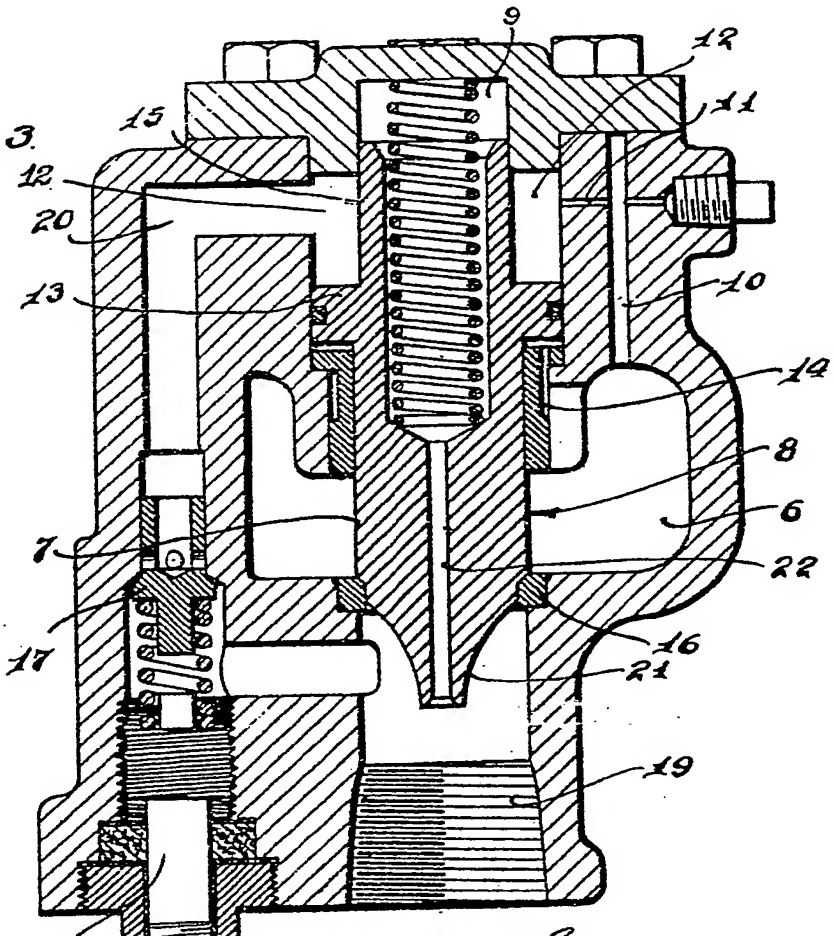
Fig. 3.



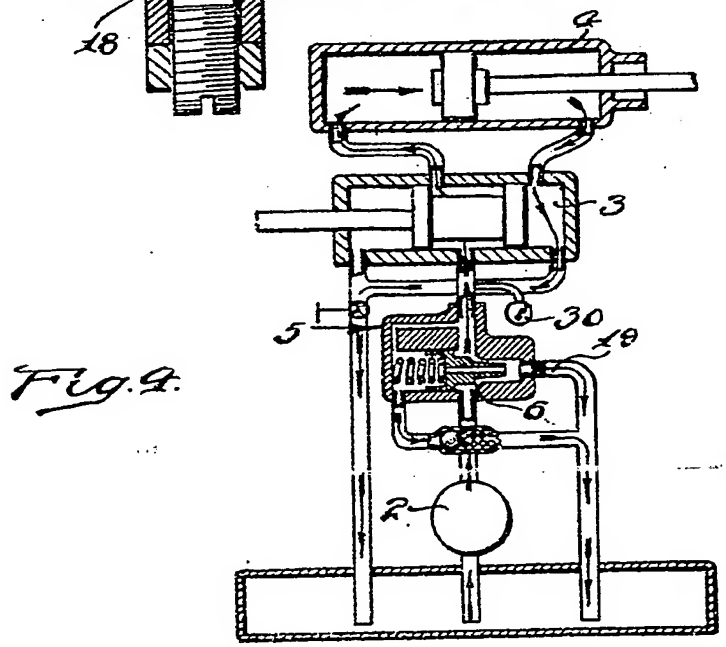


Fig. 4.

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393,761 COMPLETE SPECIFICATION

2 SHEETS
SHEET 2

SHEET 1

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

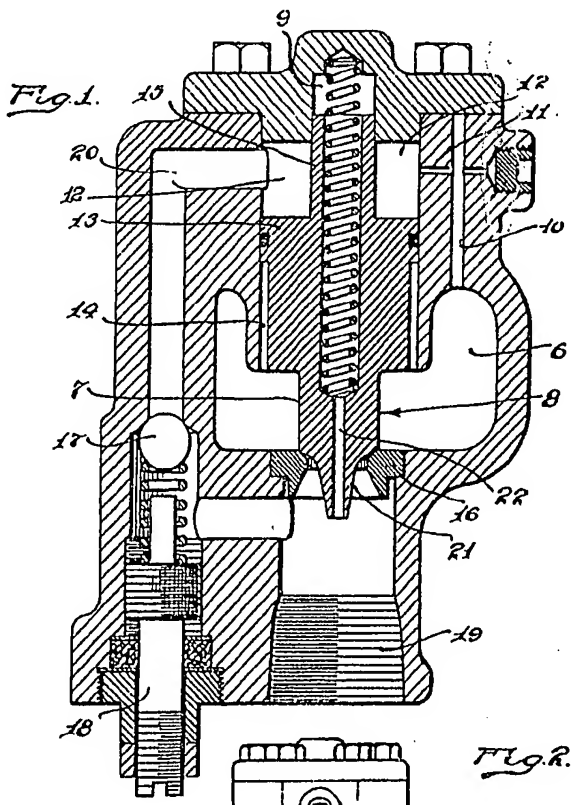


Fig. 2.

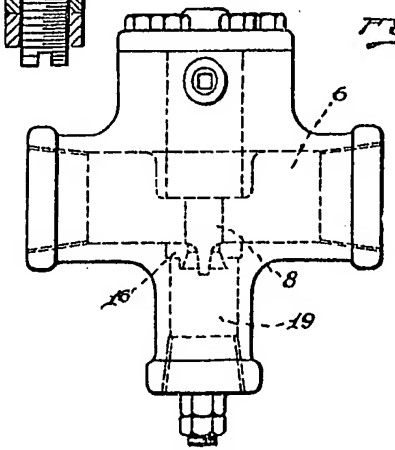
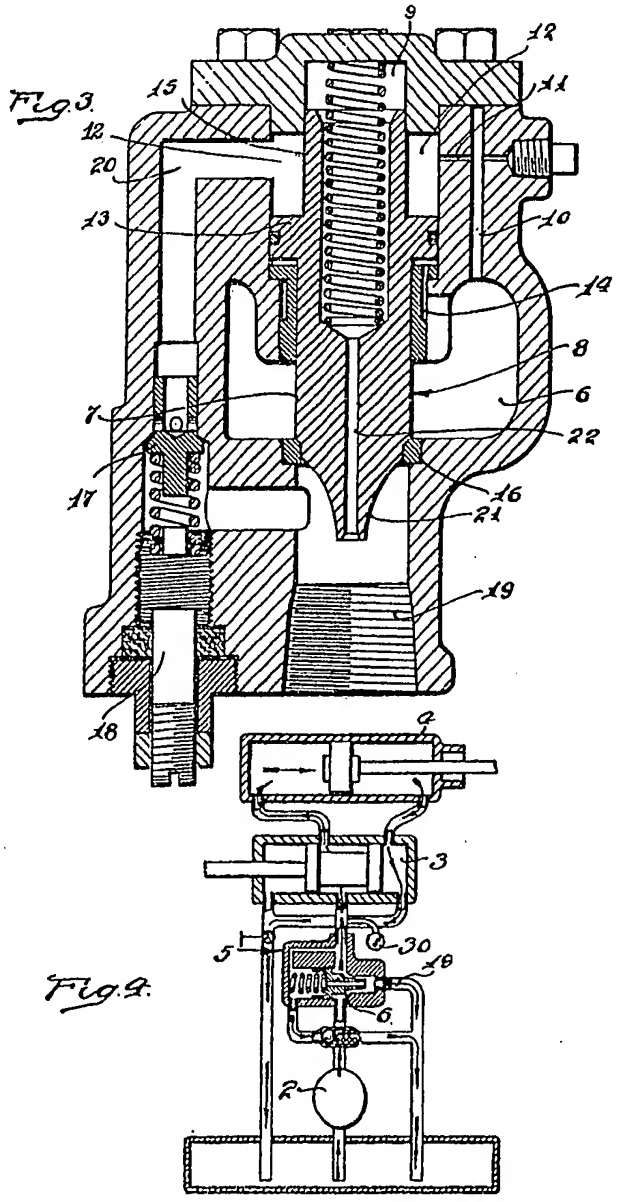


Fig. 3.



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